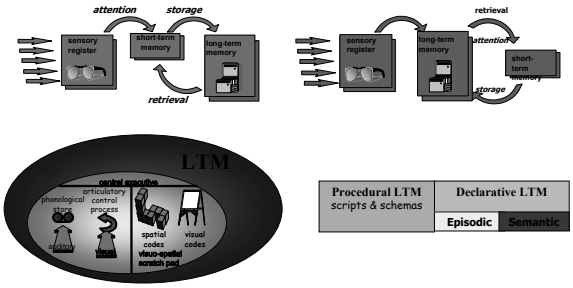
Cognitive Psychology

PSYC230

Lecture # 8

REVIEW

Early models of memory were searching for different memory structures



REVIEW

Later models of memory focused on different encoding processes

Maintenance Rehearsal

Total time/Repetition Effect

Distributed Practice Effect

Acoustic Interference Effect

Word Length & Suffix Effects

Elaborative Rehearsal

Meaningfulness, Depth of Processing & Self-reference Effects

Emotion Effect & flashbulb memories

Effort & Elaboration Effects

Encoding Variability Effect

TODAY

Encoding Processes

Encoding affects Storage
the control process affects the memory trace

Stored information can also affect how we encode new information

Organisation & Schemata

Integrating new information with stored memories

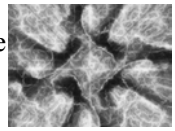
Consolidation

Why do we encode things the way we do?

1. The type of stimulus

A word like "generous" is difficult to encode as an image or a rhyme

A word like "curly" is easier to picture or rhyme

A picture like  is hard to encode in words or rhymes

Why do we encode things the way we do?

2. The type of task

Knowing you need to remember something may produce more effortful encoding

Not knowing you will need the information later can lead to very shallow encoding (untransformed)

Incidental memory

Memory for automatic or preconscious information is extremely hard to recall

Why do we encode things the way we do?

3. Your previous experience

Practice with one type of encoding may make it easier to do (*automatically*)

Your previous experience with a stimulus may lead you to encode it in a particular way

We use past experience to help us interpret new stimuli and events

Organisation in Memory

Subjective Organization

Tulving (1962)

Presented lists of unrelated words on repeated free recall trials

Each participant recalled the list in a progressively more consistent fashion

Subjects' orderings were different from one another
and definitely non-random!

Organisation in Memory

Subjective Organization

Tulving presented participants with a list of unrelated words, followed by free recall task

bean	lettuce
gold	celery
robin	iron
silver	jay
finch	elephant
lion	bluebird
lead	monkey
gazelle	potato

Organisation in Memory

Subjective Organization

When the participants recalled the words they listed them in **categorical clusters**

bean	robin
potato	finch
celery	jay
lettuce	bluebird
gold	elephant
silver	lion
iron	monkey
lead	gazelle

Organisation in Memory

Organisation as an aid to memory

(Bower, Clark, Lesgold, & Winzenz, 1969)

Next week's laboratory practical

Presented word lists to participants in either organised or random arrangements

Two groups of subjects, first group received organised lists, second group received randomly ordered lists

Four lists presented one at a time, each list presented twice

Organisation in Memory

Organisation as an aid to memory

Group 1 Randomly ordered list:

TOYOTA			
AIR		QUANTAS	
TRAIN	YAMAHA	AIR NZ	BUS
4 wheels	Private	Taxi	Public
Honda	Rover	2 wheels	Ford
Land	Ducati	Transportation	Ansett

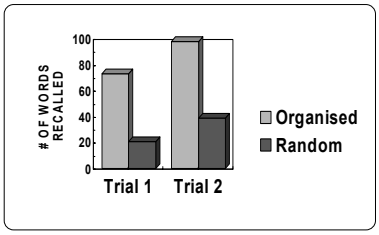
Group 2 Organised list:

TRANSPORTATION			
PUBLIC		PRIVATE	
LAND	AIR	4 WHEELS	2 WHEELS
Bus	Quantas	Ford	Yamaha
Train	Air NZ	Rover	Ducati
Taxi	Ansett	Toyota	Honda

Organisation in Memory

Organisation as an aid to memory

Bower et. al. found that the organised condition produced significantly better recall



Organisation in Memory

Organisation as an aid to memory

Cognitive principle

Organisation of information during encoding improves recall of information

Experimental hypothesis

Recall accuracy will be better for organised word lists

Independent variable

random vs. organised word lists

Dependent variable

the percentage of words correctly recalled (& number of intrusions)

Organisation in Memory

Organisation matters

Organising information during encoding links it with previously stored information and reduces how much new material must be encoded

Prior knowledge affects how we encode something

Schema Theories

Schema(ta) are mental frameworks for organising and representing knowledge

They include typical, general facts about objects, events, and relationships

Schemata save resources:
we can make assumptions (default values)
& reduce what we have to remember

I just got a puppy which may not have been a good idea 'cause the landlord just put in new carpeting

Schema Theories

Once a schema has been activated it can guide attention and the way incoming information is encoded

Can also be used to trigger automatic motor programs and procedures

Elements that don't fit a schema will be distinctive

Schema Theories

"War of the Ghosts"

(Bartlett, 1932)

We use schemata to understand and recall new information

Bartlett presented European participants with Native American folk tales whose structure followed a different schema than they were used to.

Schema Theories

Results

Omissions-- recall lacked many details
Recalled stories were "normalised" to fit European folk & fairy tale schemata
Argued that recall is a reconstructive process
(more about that next week)

V. Propp, 1928
The Morphology of the Folktale

Identified 31 functions common to (European) folktales, not all are present in every tale, but they always follow a specific order (a grammar)

Schema Theories

The specific words and facts in the folktale (or the television show) aren't the point, if fact a story rarely gets told in exactly the same way twice.

The message is contained in the structure and relationship between the people, the elements, and the events.

Our experience with the story grammar or schema makes it easier to follow and remember the message

Washing clothes

Bransford and Johnson (1972)
Comprehension & Recall in a familiar context

	Maximum score	No Topic 1 reading	Context before	Context after
Comprehension ratings	7.0	2.3	4.5	2.1
Number of ideas recalled	18.0	2.8	5.3	2.7

Schema Theories

Tulving & Pearlstone (1966)
Students given a list of words to remember
Encoding: Students hear an announcement of the category (e.g., clothing) followed by list of words to remember (e.g., shirt, belt, socks, etc)

Retrieval
No Label: Write down as many words from word list as possible
Label: Students given "clothing" label, then told to write down as many words from word list

Students given label recalled twice the number of words as students without label

Schema Theories

Schemata help us organise information

If we can place new information into an existing schema we understand and remember it better

Lesson: Read the assigned chapter before you come to the lecture!

Many schemata are stereotyped situations used to represent the order of events and relationships between objects in the situation

These types of schemata are called *scripts*

Origins in AI: Schank & Abelson (1977)

Memory Organisation Packets -- MOPs & E-MOPs

Schema Theories
Effects of Scripts on Memory
(Bower, Black & Turner, 1979)

Memory for stories based on scripts (e.g., a visit to a doctor's office)

Recall effects:
Participants recalled information not actually in the stories but part of the underlying script (intrusions)

Recognition effects:
Other participants falsely recognised statements as being in the original story if they conformed to the script but not if they did not fit the script

Schema Theories

Frames

Very similar to scripts but represent stereotyped setting or situation without necessarily including a sequence of actions or events
(Minsky, 1975)

Like scripts, they have various levels and "slots" that are filled by the particulars of the situation

Frames include information about how to use them, what to expect, and what to do if expectations are not met

Schema Theories

Schemata (scripts & frames) save cognitive resources; they guide us where to look, what to do, and what to expect, based on experience

Memory for schemata is very good

Memory for specific instances of script items is not as good, we may get fooled by the *default values*

Memory for specific events or objects that violate a script is very good

Memory Processes

Attention: Sampling the incoming information

Encoding: Transforming and working with the information

Storage: Consolidating encoded information with previous memories

Retrieval: Accessing the information

Consolidation

Integrating new information with stored memories takes time

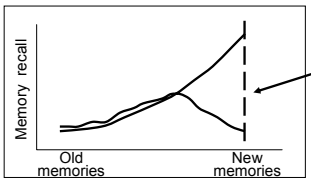
Some of this integration process appears to be automatic & self-organising

The consolidation process can be seen in the *temporal gradient*

Found in the Amnesiac syndrome, ECT effects, & REM sleep studies

Consolidation

The Temporal Gradient
Retrograde amnesia
loss of memories for a period prior to the injury, accident, surgery, disease, etc.



Consolidation

How does consolidation work?

Shiffrin's Active Trace Theory

Connections between neurons take time to become stable (& permanent)

Hebb's Organisation of Behaviour

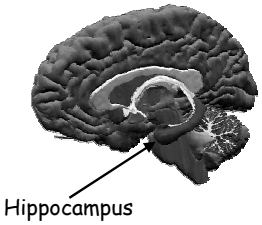
Reverberations of neural activity store information for short periods
Strengthening of connections between activated neurons store information over the long term

Consolidation

How does consolidation work?

Hippocampus

hippos (horse) + kampos (sea monster)



A very old brain structure involved in emotion, sexuality, navigation & memory

As we experience the world, the hippocampus monitors the activity of other areas of the brain

It forms an episodic "map" of the experiences, full of contextual information

During REM sleep (or quiet rest), it plays back those experiences to other memory sites (cortex), making the new information permanent

Hippocampus

Responsible for consolidation of new memories

Rapid learning of new information

Damage to the hippocampus produces retrograde amnesia along a temporal gradient

Damage to the hippocampus results in an inability to form new declarative memories (anterograde amnesia)

As we age, it shrinks in volume by about 15%

It also appears to shrink in people exposed to severe trauma (abuse, combat, etc.)

Consolidation

How does consolidation work?

Hippocampus appears to "play back" recent information for the cortex

Seems to affect all memories: implicit (procedural & otherwise) and explicit (declarative) for up to 3 years

Over time, hippocampus appears to become less important

Memories become more dependent on cortical areas, less on hippocampal regions

Consolidation

Hippocampus & nearby areas	Cortical areas
- quick acquisition of information	- slow acquisition of information
- can't store information forever	- much longer term storage

Why two memory systems?

Hippocampus acquires information rapidly but produces little overlap in representations (helps reduce interference)

Cortical brain areas are slower but result in highly overlapping representations to allow generalization

Semantic similarity (overlap) is bad if you want very specific information

Semantic similarity is good if you want to retain useful, general knowledge (like schemata)

If the information is stored well, you should be able to remember it when you need it

The next step is getting the information out of LTM

Retrieval processes

Why do we forget?

Reminder: Quiz #2 next week